MULTIMEDIA UNIVERSITY®

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2022/2023 (Term 2210)

HBC1011 – BIOCHEMISTRY I

18 FEBRUARY 2023
9:00 AM – 11:00 AM
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This paper consists of **4 pages** (including the front page)
2. This paper consists of **4 Short Answer Type questions**. All questions carry equal marks (10 marks per question).
3. Answer **ALL QUESTIONS.**
4. Print your answers **clearly** and **neatly** in the Answer Booklet provided.
5. You may use calculator in this examination.

Question 1

A. What is the difference between covalent and noncovalent bonds? Give ONE example of noncovalent bond. [1 mark]

B. Both cellulose and starch are homopolymers, which are formed by joining many identical glucose units. However, they have very different structures and functions. What are their functions? Explain briefly their biochemical difference. [1 mark]

C. What is the key finding from the Miller-Urey experiment? [1 mark]

D. What is the selective advantage of DNA over RNA as the genetic material? [1 mark]

E. How do cells differentiate into different cell types if they all contain same DNA? [1 mark]

F. Give TWO examples of the biological importance of water. [2 marks]

G. Convert 15 % (w/v) NaCl to _____ mg/ml. [1 mark]

H. Calculate the ratio of the concentration of acetate and acetic acid required in a buffer systems of pH 4.2 given that the K_a is 1.74×10^{-5}. [1 mark]

I. What is phytochemical? Give ONE example. [1 mark]

Question 2

A. What is isoelectric point? List ONE positively charged and ONE negatively charged amino acid at neutral pH. [2 marks]

B. List ONE difference between globular and fibrous proteins. Give ONE example each. [2 marks]

C. Why are almost all peptide bonds in proteins present in trans configuration? [1 mark]

D. Name TWO types of protein chromatography for protein purification. [1 mark]

E. Name TWO chemicals which may interfere the reaction of protein quantitation assays. [1 mark]

F. What is the use of protein standard marker in protein electrophoresis? [1 mark]

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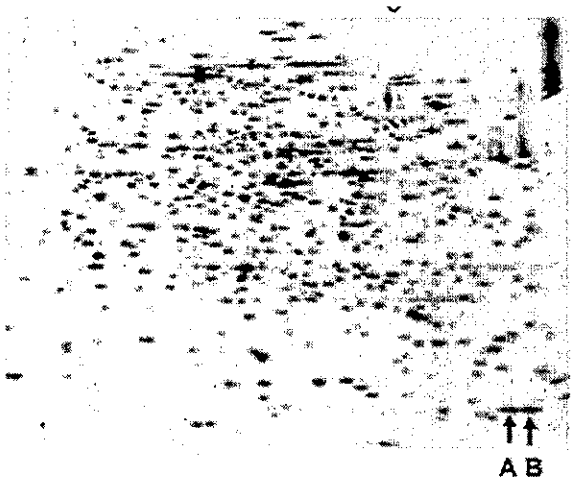
G. Protein A and B are separated using 2D gel electrophoresis. How do proteins separate in 2D gel electrophoresis? Describe the chemical properties of protein A and B based on the observation of gel separation. [2 marks]



Question 3

A. What does it mean to say that the DNA strands in a double helix have opposite directionality? [1 mark]

B. What might happen if the genetic code is not degenerate? [1 mark]

C. Why does DNA with a high A-T content have a lower melting temperature, Tm than DNA with a high G-C content? [1 mark]

D. List TWO approaches that measure expression of thousands of genes in a single experiment. [1 mark]

E. List TWO factors that affect the specificity of polymerase chain reaction. [1 mark]

F. What is the application of restriction enzymes and DNA ligase in molecular biology? [2 marks]

G. What is a sequence alignment? [1 mark]

H. Explain why high sequence similarity sometimes does not necessarily imply homology. [1 mark]

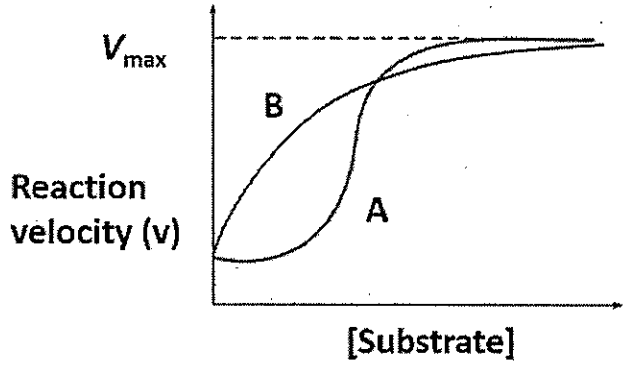
I. The three-dimensional structure of protein is more conserved evolutionary than its sequence. Why is this the case? [1 mark]

Continued...

Question 4

A. What are isomers? What is the common form of isomer found in amino acid and carbohydrates? [2 marks]

B. Define allosteric enzyme and its binding properties. Identify the enzyme kinetic plotted with allosteric enzyme in figure below. [2 marks]



C. Distinguish between the "lock-and-key" and "induced-fit" models for binding of a substrate to an enzyme. [2 marks]

D. Explain why you should avoid partially hydrogenated vegetable oils in your diet. [1 mark]

E. What is the function of an aquaporin? [1 mark]

F. Compare the difference between primary and secondary active transport. [2 marks]

End of paper